Appendix A: Jordanian Standards and Laws

JS 1145/ 1996

Sludge: Uses of Sludge in Agriculture

Department for Standards and Metrology

Unofficial Translation

Contents

1. Scope

This metrological standard is concerned with the requirements that must be available in the sludge resulted from the wastewater treatment plants, and intended to be used in agricultural lands.

2. Definitions

2.1 **Sludge**: It is the solid materials, with dry or wet structure, resulted from the treated wastewater from the wastewater treatment plants.

2.2 **Domestic Wastewater**: Water resulted from residential **use (activities)**, which might be mixed with industrial wastewater that meets the requirements of linkages to the sewer network issued by the **DMS**.

2.3 **Treated Sludge**: Sludge that is exposed to any of the treatment method found in the attachment of this standard.

2.4 The weight of the dry sludge: It is the weight of the total solids after drying it at a temperature of (103 – 105 C^{o}) for 24 hours.

3. General Requirements

3.1 It is prohibited to use untreated sludge for agricultural purposes.
3.2 Treated sludge will be used for the first level (as appeared in the attachment).
3.2.1 It is allowable to use the sludge as a conditioner for improving the Badia soil characteristics, it is required to plough it directly especially those lands that are identified for forestation.
3.2.2 Treated sludge shall be added during the period between early April and late June.
3.3 Treated sludge will be used for the second level (as appeared in the attachment).
3.3.1 It is allowed to use sludge in the cases appeared in article (3-2).
3.3.2 It is allowed to use treated sludge in the beginning of soil preparation for planting fruit trees, fodder, and field crops taking into consideration not to harvest or graze fodder and field crops before 3 months lapsed after sludge application.

3.3.3 It is prohibited to apply the sludge as a fertilizer to vegetables, loans and turf, public parks, protected agricultural nurseries, and lands found within the residential complexes.

3.4 the sensitivity of the groundwater basins and it's apt to pollution shall be taken into consideration when add sludge to lands, as well as, the distance between the lands and the dams, the wadis, the surface water and the water harvesting projects.

3.5 Treated sludge shall not be added for agricultural purposes except after the approval the related official organizations.

4. Metrological Requirements

The following metrological requirements must be met when the treated sludge is used for agricultural purposes.

4-1 The maximum allowable limit for sludge characteristics shall be as indicated in Table 1.

4-2 The annual added quantity of treated sludge to the soil is calculated according to the element of the lowest concentration value as follows:

$$\textit{The average annual sludge application}\,(\textit{MetricTon}/\textit{ha}/365\,\textit{days} = \frac{\textit{The average element application}\,(\textit{kg}/\textit{ha}/365\,\textit{days})}{\textit{Element concentration in sludge sample}\,(\textit{mg}/\textit{kg of dry sample}) \times 0.001}$$

4-3 When treated sludge used for agricultural purposes, the bio-pollutants shall be as indicated in Table 2.

4.4 The engineering average for 7 different treated sludge shall be taken directly before use or dispose.

Table 1. The maximum allowable limits for trace elements in treated sludge

criteria	Element conc. In sludge	Average application	The maximum

	(mg/ kg dry)	(kg/ha/365 days)	accumulation limits of elements in soil (kg/ha)
As	75	2	41
Cd	85	1.9	39
Cr	3000	150	3000
Cu	4300	75	1500
Pb	840	15	300
Hg	57	0.85	17
Mo	75	0.9	18
Ni	420	21	420
Se	100	5	100
Zn	7500	140	2800
Co	150	1.8	36

Table 2. The biological pollutant limits for sludge for agricultural purposes.

Bio-Pollutant	Limits of pollutant in sludge (first level treatment)	Limits of pollutant in sludge (2nd level treatment)
TFCC (MPN)	$2*10^6$ per g	$1*10^3$ per g
Salmonella	-	< 3 / 4 g dry
Nematodes eggs	-	< 1 / 4 g dry
Viruses	-	< 1 (unit) / 4 g dry

- **dry: total dry solids**

5- References

1- USEPA., Code of federal regulation, Criteria for classification:- of sold waste disposal practices (1992).
2- USEPA." Standards for the use or disposal of sewage sludge 1992"
3- The European Community" Council directive on the protection of the environment, and in particular the soil, when sludge is used in agriculture 1989.
4- FAO paper No. 47. Wastewater treatment and use in agriculture, 1992.

Annex 1

Levels of Sludge Treatment

I) **Level One**: It aims at reducing pathogen and helminthes from sludge. It can be achieved by one of the following processes:

a- **Aerobic digestion:**
This process is achieved by shaking sludge with the presence of air or O_2 with keeping the aerobic conditions for 40 days at 20°C or for 60 days at 15°C with the reduction in volatile solid substance not less than 38%.

2) **Aerobic drying:**
Liquid sludge is allowed to infiltrate and/or dried in sand filter basins or in paved basins or unpaved, provided that sludge thickness should not be more than (23 cm). Sludge must remain in these basins for at least 3 months provided that daily temperature should be over 0°C for 2 months out of three months.

3) **Anaerobic digestion:**
This process is achieved without O_2, provided that sludge must remain for 15 days at temperature ranges from (35-55°C) or for 60 days at temperature 20°C with the reduction in volatile solid substance of not less than 38%.

4) **Fermentation:**
This process is achieved by using a container that contain a fixed aeration column or by collecting the fertilizer together. The solid mass remains at temperature 40°C for 5 days where the temperature should reach to more than 55°C for a period not less than 4 hrs during this period.

5) **Treatment by raising the pH of the Liquid Sludge**:
This process is achieved by the addition of sufficient quantity of lime to give an alkalinity degree equal to 12 (pH=12) for a period not less than 2 hrs.

6) **Other methods**:
Any other method that are capable to achieve the levels mentioned in the aforementioned methods in terms of reducing volatile solid substance or prevent the attraction of pathogens carriers to it.

II. **Level two**: It aims at more reduction of pathogens in the sludge content than the case in level one and it can be achieved by one of the following processes:

1- **Fermentation**: it is possible that this process can be done as follow:
A) By containers method. Sludge remains at temperature not less than 55°C for 3 days.
b) By using fixed aerated tube, sludge then remains at temperature not less than 55°C for 3 days.
c) By sludge compressing method where sludge is remain at temperature not less than 55°C for 15 days during sludge fermentation period.

(Shaking must be kept at least 5 times during high temperature levels).

2- **Drying by heating :**

Sludge is dried by removing water through direct or indirect tangibility touch with hot gases where humidity % is reduced to 10% or below and the sludge temperature increase over 80°C or the wet temperature for gas that heat sludge not less than 80°C at the end of the heating process.

3- **Heating treatment**:
Liquid sludge is heated to a temperature 180°C for 30 min.

4- **Heating aerobic digestion**:
Liquid sludge is shacked in the presence of air or O_2 with keeping the aerobic condition for 10 days at temperature 55-60°C with the reduction in volatile solid substance by at least 38%.

5- **Other methods**:
Any other method that is capable of achieving the levels mentioned above in terms of reducing the volatile solid substance and presentation of attraction of pathogens carriers to it.

The following methods if added to the above aforementioned treatment process it will enhance pathogen reduction:

A- Treatment by β-ray (B ray treated)

Sludge is exposed to β-ray from the nuclear accelerator by does not less than (1) mega rad at room temperature (20°C).

B-Treatment **by α ray: (α ray treatment)**:

Sludge treated by α ray from specific isotopes like C060 or Cs 137 by does not less than (1) megarad at romm temperature (20°C).

C) Pastarization : Sludge remains for 30 min at temperature not less than 70°C.

d) Other methods:

Any other methods or operation condition that are acceptable if it leads to reducing pathogens to the level obtained by using any method of the aforementioned methods.

Reference:

USEPA, Code of federal regulation, criteria for classification of solid waste disposal practices (1992).

Water Authority of Jordan

Water - Treated Domestic Wastewater

*JS 893/1995

January 1996

1 Scope

This standard specification is related to the criteria that should be met for the treated effluent wastewater from the Wastewater treatment plants which is discharged or reused as mentioned in table No. 1

2 Definitions

Wastewater: It is the water that results from domestic use and could be mixed with industrial wastewater of a quality which meets the connection requirements set by the official body.

3 General Criteria

3.1

The treated wastewater must meet the specified standards shown in Table 1 according to its planned usage.

3.2

When using treated effluent in irrigation of fruit trees, cooked vegetables and fodder, then irrigation must be ceased two weeks before collecting the product of ripped trees and vegetables and fodder. Fallen fruits should be discarded.

3.3

The adverse effect of certain effluent quality parameters on soil characteristics and certain crops should be considered.

3.4

It is prohibited to use sprinkler system for irrigation .

3.5

It is prohibited to use the treated effluent in irrigation of crops that can be eaten raw such as tomatoes, cucumber, carrots, lettuce, radish, mint, barsley ... etc.

3.6

Closed pipe or lined channels must be used for the transmission of treated effluent in areas where the permeability is high which then can affect underground water or surface water that could be used for potable purposes.

3.7

It is prohibited to dilute this water by mixing it at the treatment plant site with clean water in order to achieve the requirement of this standard.

3.8

It is prohibited to use the treated effluent to recharge an aquifer which is used for potable water supply purposes.

4- Standard Criteria

The treated wastewater must meet the standard criteria shown in Table 1 according to its final usage and depends on the following

4.1

Samples must be representative and collected over a day except for those characteristics where their analysis need Grab samples, and the number of samples and the period for taking the samples must be as shown in Table 2.

4.2

For the purposes of evaluating the quality of the treated effluent for the different purposes shown in Table 1, periodic times shown in Table 2 should be adapted.

4.3

The ratio of the samples exceeding the criteria shown in Table 1 must not be more than 20% of the samples collected during the period of times shown in Table 2 provided that the exceeding value for any characteristic is not more than five times the allowable limit shown in Table 1.

4.4

Samples to be taken, kept and analyzed according to the book of the standards methods for testing of water and wastewater which is issued by the American Society for public health and the American Federal Society for water research and pollution inspection and any other approved analysis methods if not available in the referenced book.

Technical Terms

1- Bio-Oxygen demand (B.O.D)
2- Chemical Oxygen demand (C.O.D)
3- Complicit sample
4- Conventional wastewater treatment plants
5- Dissolved Oxygen (D.O)
6- Faecal coliforms
7- Filter
8- Nutrients
9- Grab samples
10- Intestinal nematodes
11- Suspended solids (S.S)
12- Total dissolved solids (T.D.S)
13- Waste stabilization ponds

Scientifical References

1- Jordanian Standard Specification No. (202/1991)
2- Sanitary evidences for use of treated Effluent in Irrigation and raising of aquatic life
The serial of Technical Reports No. (778), Worl Health Organization 1990.
3- Canadian Council of Resources and Environmental Ministers, "Canadian Water Quality Guidelines" March 1987
4- FAO Guidelines for agriculture (1991)
5- Reuse of effluents, methods of wastewater treatment and health safeguards. (WHO) (1989)
6- Standard methods for the examination of water and wastewater, 1989

Table 1 Standard Conditions for Treated Wastewater as a maximum figure unless mentioned otherwise

Quality Parameter mg/l except otherwise indicated	Cooked Vegetables	Ripped tress & Industrial Products	Discharge to Wadi	Recharge aquifer	Fish	Irrigate Parks	Irrigate Fodder
BOD5	150	150	50	50	-	50	250
COD	500	500	200	200	-	200	700
Do	More than 2	More than 2	More than 2	More than 2	More than 2	More than 2	More than 1
TDS	2000	2000	2000	1500	2000	2000	2000
TSS	200	200	50	50	25	50	250
PH	6.0-9.0	6.0-9.0	6.0-9.0	6.0-9.0	6.0-9.0	6.0-9.0	6.0-9.0
Color (PCU)	-	-	75	75	-	75	-
FOG	8	8	8	None	8	8	12
Phenol	0.002	0.002	0.002	0.002	0.001	0.002	0.002
MBAS	50	50	25	15	0.2	15	50
NO3-N	50	50	25	25	-	25	50
NH4-N	-	-	15	15	0.5	50	-
T-N	100	100	50	50	-	100	-
PO4-P	-	-	15	15	-	15	-
Cl-	350	350	350	350	-	350	350
SO4-	1000	1000	1000	1000	-	1000	1000
CO3	6	6	6	6	-	6	6
HCO3	520	520	520	520	-	520	520
Na+	230	230	230	230	-	230	230
Mg++	60	60	60	60	-	60	60
Ca++	400	400	400	400	-	400	400
SAR	9	9	9	9	-	12	9
Residual C12	0.05	-	-	-	-	0.5	-
Al	5	5	5	1	-	5	5
As	0.1	0.1	0.05	0.05	0;05	0.1	0.1
Bc	0.1	0.1	0.1	0.1	1.1	0.1	0.1

Quality Parameter mg/1 except otherwise indicated	Cooked Vegetables	Ripped tress & Industrial Products	Discharge to Wadi	Recharge aquifer	Fish	Irrigate Parks	Irrigate Fodder
Cu	0.2	0.2	0.2	0.2	0.04	0.2	0.2
F	1.0	1.0	1.0	1.0	1.5	1.0	1.0
Fe	5.0	5.0	2.0	1.0	0.5	5.0	5.0
Li	2.5	5.0	1.0	1.0	-	3.0	5.0
Mn	0.2	0.2	0.2	0.2	1.0	0.2	0.2
Ni	0.2	0.2	0.2	0.2	0.4	0.2	0.2
Pb	5.0	5.0	0.1	0.1	0.15	0.1	5.0
Sc	0.02	0.02	0.02	0.02	0.05	0.02	0.02
Cd	0.01	0.01	0.01	0.01	0.015	0.01	0.01
Zn	2.0	2.0	15	15	0.6	2.0	2.0
CN	0.1	0.1	0.1	0.1	0.005	0.1	0.1
Cr	0.1	0.1	0.05	0.05	0.1	0.1	0.1
Hg	0.001	0.001	0.001	0.001	0.00005	0.001	0.001
V	0.1	0.1	0.1	0.1	-	00.1	0.1
Co	0.05	0.05	0.05	0.05	-	0.05	0.05
B	1.0	1.0	2.0	1.0	-	3.0	3.0
Mo	0.01	0.01	0.01	0.01	-	0.01	0.01
TFCC (MFN/100mL)	1000	-	1000	1000	10000	200	-
Salmonella	-	-	-	-	(9) 100000	None	-
Amoeba & Gardia (Cyst/L)	Less than 1	-	-	-	-	None	-
Nematodes (Eggs/L)	Less than 1	-	Less than 1	-	-	Less than 1	Less than 1

Table 2 Quality Inspection

No.	Description	Sampling Frequency	* Period of Evaluation
1.	Microbiological tests - Tests for intestinal Coliforms and Fecal Clifrom - Tests for germs causing diseases	Sample/Two weeks ** Sample/Two weeks/ In summer *** Sample/ One month/In winter	Three months If any sample is found to by positive than two extra samples should be taken with two days difference between then, and if the results of these samples are positive then the use of water in irrigation must be ceased till contamination is removed.
2.	Biological tests - Intestinal nematodes	Sample/Two months	One year
3.	Chemical tests - Regular test - Tests relating to trace element and heavy metals	Sample/One month Sample/Two months	One year One year

(*) Period of evaluation : The period before evaluation depends on the quality of the water

(**) Summer: The period between the beginning of May until the end of October

(***) Winter: The period between the beginning of November until the end of April .

Excerpts from Jordanian Labour Law

Instructions Concerning Sectors Subject to the Provisions of the Regulation for Forming Committees and Safety & Vocational Health Supervisors

Issued in accordance with the provisions of Article (3) of the regulation of forming Committees and Safety & Vocational Health Supervisors in establishments No. (7) for the year 1998.

Article (1)
This regulation shall be called the (The Instructions Concerning the Sectors Subject to the Provisions of the Regulation for Forming Committees and Safety & Vocational Health Supervisors) and shall come into effect from the date of its publication in the official gazette.*

Article (2)
The provisions of these instructions shall be applicable to any establishment which employees exceed (20) Employees in any of the following sectors:

a. Mines, stone quarries and all the industries concerning digging out materials from the underground, and the industries prepared for manufacturing products, changing them, arranging them, fixing them, decorating them, fielding them or preparing them for sale, and the industries of executing the shape of materials such as building ships, disassemble tools, generate dynamic powers in general & electricity, transferring the pressure of these powers and transporting them.
b. Construction and building.
c. Road and sea transporting, transportation, wire and wireless communications.
d. Information, press, printing, publication and distributing sector.
e. Tourist and hotel firms, public stores and amusement centers.
f. Shipping, discharging and storing sector.
g. Agricultural and veterinary sector, land hunting and fishing, and cooperative societies.
h. Services sector which includes (cleanness, security, sea services for ships in shipping ports, Petrol services, community services, and health firms).
i. Petrol sector.
j. Transmutation industries sector.
k. Utilities and the working associations in sewage, water, electricity and gases, and the companies which distribute same.

Minister of Labour
Dr. Mohammed Mahdi El-Farhan

Instructions concerning the protection of Employees and Establishments from dangers of Work Environment.

Issued in accordance with the provisions of Article (79) of the labour law No. (8) for the year 1996.

Article (1)
These instructions as (the special instructions for the protection of Employees and establishments from the danger of work environment) it is issued in accordance with the provision of Article (97) of labour law No. For the year 1996, and it is followed and adapted since its publishment in the official newspaper* (published in the official newspaper No. (4268) date 16/6/1998.

Article (2)
The instruments of personal protection of Employees must be able to remove or minimize the danger and harm to the safe limit allowed, and to guarantee the protection of Employees from the dangers and harms. It must be made of a quality and description that is in conformity with the descriptions and the adapted technical standards. It also must not cause the Employee any distress during his work.

Article (3)
The Employee must be provided with a special helmet for the protection of head from the danger of falling things and hit against them. Also for the protection from electricity and melting works, or skeletons of different types, digging works, building airports, pools, pavements, sea ports, bridges, roads, bridges, and tunnels communication lines, the sewage nets, water and electricity, mining works cutting stones, explosives, drilling for oil, loading & unloading, cutting trees and woods, fire fighting, mining, electricity, melting minerals and alike.
The Employee who works in open areas, exposed to dust and dirt, or which might attract his hair to machines and moving tools, the Employee, working in such sites must be provided with a special hat to protect him from all these dangers. The hat must be made of special accredited descriptions.

Article (4)
The Employee must be provided with special protective

* *Published in the Official Gazette No. (4274) dated 16/9/1998.*

b) Connected on their faces, two, or one face.
c) The value of oscillation.
d) To make sure that the electrical distribution are suitable, and not to put any other additions.
e) The danger of radiation.
9- To make the periodical checking on all cables, wires, and electrical connections in order to present the occurrence of electrical contacts, in order to avoid any sudden dangers such as fires and electrical shocks.

Article (5):

The Chemical Dangers:

1- All necessary Precautions will be taken to protect the Employees from the used chemical substance, which might leak to work surroundings, such as gases dusts, and other liquids and acids which will not exceed the limits allowed by this regulation.

All suitable procedures are taken against any hurt or health mischief to the Employees where gas or dust or refuses or any other dangerous substance during work.

c. The rooms of work at the productive establishments must have good airing, and in accordance with the health conditions stipulated by the Directorate of safety and vocational health & environment of the Ministry of Labour, in order to get rid of the dusts, gases and other harmful materials which are dangerous to health, from the generative sources, by using equipment and to find a system for industrial airing.

d. To provide all equipment of personal protection, which suits the nature of work in chemical industries, including the filter masks, and suitable foot-ware, head helmets, gloves, work clothes or outfits, leather coats, and protective eye glasses.

e. Providing suitable stores for storing the chemical materials, which are manufactured and primary, each type to be stored separately and to provide all the necessary conditions of the storing process.

f. To establish special places or buildings which are separated from the working sites of industrial operations or machines and equipment which produce dangerous dusts or gases, on the condition that these places must be provided with the necessary protective means which guarantees the non-spread of these substances in the work environment.

g. To put a label on each of the chemical materials that specifies the name of the material or substance, its chemical components, the commercial name, the way it must be dealt with, its storing process, its dangers, the preventive methods and any other relevant information.

Article (6)

Every establishment must be committed to the following:

a. To provide warning and instructing boards about the primary materials used, the manufacturing material, the equipment and the different operations, which informs about the dangers resulted from dealing with these materials and equipment. These boards must include the necessary technical instructions for prevention from injuries and work accidents. These boards should also be hanged in obvious places and at different sites of work.

b. To perform the required periodical maintenance for equipment and machines, by skilled technicians, who are specialized. This process will be carried on in order to ensure safety, and these checks must be registered in special registers which are prepared for this purpose.

c. Not to allow any person to fix or remove any preventive equipment or install any of the preventive apparatus unless the machine was out of order, on the condition that it should be put in its place before fixing the machine and re-operating it.

d. Not to own, sell, hire, or transport any of the machines or equipment which includes dangerous parts which are not safe enough.

Article (7)

The Employer, or the Directing Manager, must be committed not to leave the floor of the working site crowded with materials, machines, and productions. Suitable distances must be left around the equipment and machines, or the working units that will allow the Employees to perorm their work freely and to do the maintenance of machines and move materials with ease.

Article (8)

The Employer or the Managing Director is required, when hiring an Employee in a dangerous industry for the first time, to explain to him the dangers, which he might face during his work, or to train him for a period not less than a month under his direct supervision or the supervision of his officer in charger.

Article (9)

The safety and vocational health inspectors at the Ministry of Labour are entitled to examine the technical and scientific specialties of the substance chemical compounds and aiding row materials used in the industrial operations, in order to specify the safety levels for the dangerous to health materials, which are allowed to be provided at the work environment.

Article (10)

The Minister of Labour, and in accordance with the recommendations of the Directorate of safety, vocational health and environment at the Ministry of Labour, is allowed to add, adjust or cancel any substance regarding the names or the allowed percentages, which are mentioned in the attached chart on the condition that this act is to be published in the official gazette.

Article (11)

The Minister of Labour has to issue the necessary instructions for the implementation of this law.

Article (12)

The regulation of prevention and public safety for equipment and industrial machines No. (57) for the year 1963 to be canceled.

2. The sources of Gamma rays and its uses.
3. The sources of Beta particulars and its uses.
4. The sources of Alpha particulars and its uses.
5. Sources of heavy Ions and its special use.
6. Sources of nitrous and its special uses.

Article (22)

The radiation Employee

The radiation Employee is defined as any person who works in the circumstances of radiating work for uninterrupted period, due to the nature of his profession or because of professional existence in a radiating environment permanently, where this will lead to the possibility that the permitted dose equivalent to the whole body will exceed the annual limit allowed for a normal person (5mc/year). An example to those Employees are the ones who work in the following fields:

a. X-ray Employees in the medical field or the industrial field.
b. Technician who work in nuclear medicine.
c. The technician of radiating treatment.
d. The Employee in maintaining the radiating equipment.
e. The medical or health physicist who works in the field of radiation.
f. The doctor who works in the field of radiant diagnosis or treatment or the nuclear medicine, or the dentist who practice the radiant work.
g. Employees at labs which uses radiant substances, where radiant activity used daily is not less than 100 K.B. (Kilo Pickerel).
h. Employees in stores and nuclear energy or nuclear installations as a researcher or maintenance technician.

Article (23)

In order to protect the Employee from being exposed to the danger of radiation, the following must be considered:

- To be committed by the exposing period which is specified by the legislation concerned with this issue.
- To provide the possibility of closing or putting off the regulations or apparatus which send the radiation where the Employee is able to fully in control.
- To provide the Employee with the equipment of personal protection designed for this purpose.
- The Employee must be qualified and has an experience in the field of radioactivity or radiation.

Article (24)

The law of nuclear energy No. 14 for the year 1987 or any replacing law or regulation or instructions or decisions issued in this regard is a reference in the cases concerned with radiation which are not mentioned in these instructions.

Minister of Labour
Dr. Mohammed Mahdi El-Farhan.

Instructions for the Conditions and procedures of bringing in and Employing Non-Jordanian Employees

Issued in accordance with the text of Article No. (3) of the Regulation of Work Permits Fees for Non-Jordanian Employees No. (36) for the year 1997.

Article (1)

These instructions shall be called the (the Instructions for the Conditions and procedures of bringing in and Employing Non-Jordanian Employees) and shall come into effect from the date of its publication in the official gazette*.

Article (2)

Each of the following terms and expressions, whenever mentioned in this law, shall have the meanings assigned thereto hereunder unless the context provides otherwise.

The Kingdom	: The Hashemite Kingdom of Jordan.
Ministry	: Ministry of Labour.
Minister	: Minister of Labour.
Directorate	: Work and Employment Directorate in concern.
Employee	: The non-Jordanian Employee.

Article (3)

Every Employer who wishes to bring in or employ a non-Jordanian Employee to:

a. Present a written application to the Ministry that includes the following:

1. Name of the Establishment, name of its Owner or the Manager in charge.
2. Name of Employee as stated in his passport. date of birth, nationality, the profession which he will perform.

b. The following documents must be attached to the application:

1. A photocopy of the valid Establishment Profession License or a letter from the concerned Agricultural Directorate in case the Employee will work in the agricultural sector.
2. A photocopy of the projects and bids referred to the Employee if they are construction projects, and the places of these bids.
3. Any other documents demanded by the Ministry or forms that hould be filled up according to the situation.
4. The other documents shall be completed upon the entry of the Employee to the Kingdom's lands in accordance with item (c) hereunder.

c. The following documents must be attached to the Employment application:

1. A photocopy of the Work Contract in duplicate.
2. A photocopy of the valid Establishment Profession License or a letter from the concerned Agricultural Directorate in case the Employee will work in the

* *Published in the Official Gazette No. (4325) dated 1/2/1999.*

Appendix B: Storage and Land Requirements - Excerpts from Task Report 1

Storage Requirements

Storage volumes were developed for only Scenarios 1 and 2 because scenario 3 does not have any storage component. All storage ponds were assumed to be 5 meters deep. Surface area of the pond was then varied to achieve the desired volume according to water balance calculations.

Scenario 1 was held constant at 90,000 cu. m. This pond size was calculated in the water balance for year 2000, wet climatic conditions, because it allowed for maximizing the irrigated acreage and also allowed for completely draining the pond each year. This is a reasonable pond size that is commonly found in agricultural reuse systems. Increasing the pond size enables storage of more treated wastewater for irrigation. However, it will significantly increase the cost, reduce the land area that would otherwise be used for agricultural reuse, and increase the evaporative losses (Table 7.4).

TABLE 7.4
Comparison of Pond Size Attributes for Wet Climatic Conditions

Scenario	Year	WWTP Flow (cu. m/yr)	Area Irrigated (ha)	Amount of Reuse Water (cu. m/yr)	Pond Volume (cu. m/yr)	Evaporative Losses (cu. m/yr)	Wadi Disch. (cu.m/yr)	Cost of Reuse System (JD)
1 (storage and wadi discharge)	2000	730,000	42	379,000	90,000	33,000	318,000	N/A
1 (storage and wadi discharge)	2025	2,391,000	106	1,344,000	90,000	33,000	1,014,000	2,721,500
2 (no wadi discharge)	2025	2,391,000	157	2,083,000	850,000	308,000	0	4,099,500
3 (no storage)	2025	2,391,000	86	1,243,000	0	0	1,148,000	1,916,000
Proposed	2025	2,391,000	106	1,344,000	90,000	33,000	1,014,000	2,721,500

The difference in storage between scenarios 1 and 2 are significant regardless of climatic condition and/or treated wastewater flow projections (Table 7.4). This is because scenario 2 does not allow wadi discharge. Under this scenario, large amounts of treated wastewater will have to be stored when irrigation demand is low.

A summary of the storage requirements for Scenarios 1 and 2 are provided in Table 7.5.

TABLE 7.5
Storage Pond Characteristics for Scenarios 1 and 2, with Year 2000 and Year 2025 Flow, and Average and Wet Year Climatic Conditions (All Pond Depths are 5 meters)

Scenario	Pond Capacity Necessary	Pond Surface Area (Ha)	Months Full
Scenario 1 – Year 2000, Avg. Climatic Conditions	90,000	1.8	5
Scenario 2 – Year 2000, Avg. Climatic Conditions	225,000	4.5	1
Scenario 1 – Year 2000, Wet Climatic Conditions	90,000	1.8	5
Scenario 2 – Year 2000, Wet Climatic Conditions	275,000	5.5	1
Scenario 1 – Year 2025, Avg. Climatic Conditions	90,000	1.8	7
Scenario 2 – Year 2025, Avg. Climatic Conditions	725,000	14.5	1
Scenario 1 – Year 2025, Wet Climatic Conditions	90,000	1.8	7
Scenario 2 – Year 2025, Wet Climatic Conditions	850,000	17.0	1

For further details on the above, see Appendix D - Water Balance and Hydraulic Loading.

Land Requirements

The land requirement for each of the three scenarios, average and wet conditions and year 2000 versus year 2025 flows is presented in Table 7.6. The land requirement is expressed through hydraulic loadings and nutrient loadings for nitrogen and phosphorus at agronomic rates for the recommended orchard/fodder crops.

The land requirements directly follow previously mentioned trends for the three different scenarios. For example, scenario 2 results in the largest land requirement of the three because it has no wadi discharge and stores treated wastewater during low crop requirement periods to be applied during higher crop requirement periods. This allows for a larger irrigated land area. Conversely, this requires a significant increase in storage volume. Scenario 3 results in the least amount of irrigated land area requirement. Again this is because no storage is available and any excess treated wastewater is discharged to the wadi. Therefore, as the irrigation requirement increases to a peak monthly usage, it can only increase to match the wastewater production for that peak month (July). The land requirement is based on this peak month. All other months before and after July result in progressively less irrigation requirement and the treated wastewater difference is irreversibly lost to the wadi.

Every water balance was nitrogen limited, meaning that the nitrogen concentration limited how much treated wastewater could be applied to a parcel of land without exceeding agronomic rates. This will result in under-application of crop hydraulic loadings in the worst-case scenario, at build-out of about 20 percent. It must be kept in mind that irrigation

requirements were based on maximum crop water usage and that water balances allowed for usage of treated wastewater whenever possible. In reality, most agricultural operations do not apply this much irrigation water and they do not irrigate in the winter. This is especially true in the Mafraq area. Therefore the application of treated wastewater based on the nitrogen limitation should be adequate for both crop water requirement and nitrogen needs.

The use of other sources of water (i.e. groundwater) for dilution of the nitrogen concentration to the target value of 25 mg/l TN was not considered for this project.

TABLE 7.6
Land Base Requirements for Hydraulic, Nitrogen and Phosphorus Loadings

Scenario	Hydraulic Loading (ha)	Nitrogen Loading (ha)	Phosphorus Loading (ha)
Scenario 1 – Year 2000, Avg. Climatic Conditions	35	42	35
Scenario 2 – Year 2000, Avg. Climatic Conditions	40	49	40
Scenario 3 – Year 2000, Avg. Climatic Conditions	23	28	23
Scenario 1 – Year 2000, Wet Climatic Conditions	36	40	36
Scenario 2 – Year 2000, Wet Climatic Conditions	42	47	42
Scenario 3 – Year 2000, Wet Climatic Conditions	23	26	23
Scenario 1 – Year 2025, Avg. Climatic Conditions	94	114	94
Scenario 2 – Year 2025, Avg. Climatic Conditions	129	158	129
Scenario 3 – Year 2025, Avg. Climatic Conditions	76	93	76
Scenario 1 – Year 2025, Wet Climatic Conditions	94	106	94
Scenario 2 – Year 2025, Wet Climatic Conditions	139	157	139
Scenario 3 – Year 2025, Wet Climatic Conditions	76	86	76

Appendix C: Correspondence

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT
BUREAU FOR ASIA AND THE NEAR EAST
WASHINGTON, D.C. 20523

FAX MESSAGE

To:	Amal Hijazi, MEO
Organization:	USAID/Jordan
Fax Number:	962-6-592-0143

FROM: John Wilson, AID/ANE/SPOTS
Phone: (202) 712-4633 FAX: (202) 216-3171

Number of Pages: 3 Date: March 26, 2001

Comments:

Amal:

I have reviewed and hereby approve the Environmental Assessment Scoping Statement for the Mafraq Wastewater Treatment Plant and Reuse Application Project. I found the Scoping Statement well-written and comprehensive. Nice job!

Please note that if the EA team determines that it is necessary to develop guidelines for insect pest control that may involve the use of pesticides, such recommendations should comply with the requirements established under 22 CFR 216.3(b), "Pesticide Procedures," and be incorporated into the EA. I am certainly not opposed to such pesticide use, if necessary, but want to make sure that any recommended use is consistent with Agency requirements.

I look forward to receiving the EA for my review and approval.

Regards,

John O. Wilson

John O. Wilson
ANE Bureau Environmental Officer

****

OPTIONAL FORM 99 (7-90)
FAX TRANSMITTAL # of pages ▸ 3
To Charlotte Nielsen From Amal Hijazi
Dept./Agency CH2MHILL Phone # 5920101
Fax # 5682150 Fax # 5920143
NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

CH2M HILL Jordan
c/o Jordanian Consulting Engineer Co
Abdel Hameed Sharaf St.
Air France Building
P.O. Box 926963
Amman, 11190 Jordan
Tel ++962 6 5 606150
Fax ++962 6 5 682150
e-mail: CH2M@go.com.jo

Mr. Akel Biltaji,
Minister of Tourism and Antiquities
Ministry of Tourism and Antiquities
Amman, Jordan

April 23, 2001

Dear Mr. Biltaji,

The Ministry of Water and Irrigation (MWI) of Jordan is cooperating with the United States Agency for International Development (USAID) to study and upgrade the existing wastewater treatment plant for the town of Mafraq in northern Jordan. In addition to upgrading the plant, the project will implement an effluent reuse scheme that would serve as a demonstration project for other small to medium-sized towns in Jordan.

In accordance to USAID regulations, an Environmental Assessment (EA) report will be prepared for the proposed project. The EA requires identifying significant environmental issues associated with the project, including effects on archeological and historical sites. Since the proposed plant will be constructed within the boundaries of the existing plant, the archeological effects relating to the proposed reuse sites are of greater concern.

We would appreciate your providing us with information about the likelihood of the existence of any archeological sites within the area, as well as any plans for tourism development in the region which may be affected by the construction of the new plant and the reuse sites.

Please find attached a copy of the Pre-Scoping Brief, which summarizes the proposed project and the major environmental issues. A map of the area and the existing WWTP site is included in the Brief, and the approximate areas of the plant and proposed reuse sites are highlighted.

We look forward to hearing from you at your earliest convenience.

Yours sincerely,

Charlotte C. Nielsen

CH2M HILL
Charlotte C. Nielsen
Environmental Task Leader

بسم الله الرحمن الرحيم

THE HASHEMITE KINGDOM
OF JORDAN
MINISTRY OF TOURISM & ANTIQUITIES
Department of Antiquities
Amman

المملكة الأردنية الهاشمية
وزارة السياحة والاثار
دائرة الآثار العامة
عمان

Ref. No
Date

الرقم ٢/٤/٥ /١٩٠١
التاريخ ٢٠٠١/٦/١١
الموافق ١٤٢٢/٣/

السيدة شارلوت نيلسن

مديرة الشركة الاردنية للاستشارات الهندسيه

ارجو ان اعلمكم انه بعد الكشف الحسي على القطعه المنوي توسعتها لمحطة تنقية المياه في محافظة المفرق من قبل مفتش آثار المفرق السيد ناصر خصاونه تبين ان الموقع المقترح لا يشكل عائقاً على المواقع الاثريه المحيطه بالموقع .

وعليه ارجو ان اعلمكم بانه لا توجد ممانعه من دائرة الآثار العامه على توسعة المحطه المشار اليها اعلاه .

واقبلوا فائق الاحترام

مدير عام دائرة الآثار

د.فواز الخريشة

نسخه/نائب المدير العام
نسخه/المساعد الفني
نسخه/مفتش آثار المفرق
ن أ/ج ش

TRANSLATION

The Hashemite Kingdom of Jordan
Ministry of Tourism & Antiquities
Department of Antiquities
Amman

June 11, 2001

Mrs. Charlotte Nielsen

This is to inform you that following the site visit made by the Antiquities Inspector, Mr. Naser Khasawneh, for the Mafraq Wastewater Treatment Plant, we found no effect on the nearby archeological sites.

There is therefore no objection from the Department of Antiquities to expanding the above-mentioned plant.

Best regards,

Dr. Fawaz Al-Khraisha
General Director

بسم الله الرحمن الرحيم

THE HASHEMITE KINGDOM
OF JORDAN
MINISTRY OF TOURISM & ANTIQUITIES
Department of Antiquities
Amman

المملكة الأردنية الهاشمية
وزارة السياحة والاثار
دائرة الآثار العامة
عمان

Ref. No 5/4/2/1670 الرقم .....
Date 21/5/2001 التاريخ .....
الموافق .....

Ms. Charlotte C. Nielsen
CH2M HILL Jordan
c/o Jordanian Consulting Engineer Co.
Abdel Hameed Sharaf str.
Air France Building
P.O.Box 926963
Fax: 5682150

Dear Ms. Nielsen,

In reference to your letter of April 23, 2001 to H.E Mr. Akel Biltaji, Minister of Tourism & Antiquities regarding your request for information about the likelihood of the existence of any archaeological sites within the area in which the proposed wastewater treatment plant for the town of Mafraq will be constructed.

We have charged the District Inspector of Mafraq, Mr. Naser Khasawneh, for providing you with the requested information . His telephone number is as follows: 02/6231885.

Thank you for your kind cooperation and interest.

Yours sincerely,
Faisal Qudah
Dr. Fawwaz Al-Khreyshah
General - Director

هاتف: ٤٦٤٤٣٣٦ ، ٤٦٤١٢٧٥ ، فاكس: ٤٦٤٤٣٢٠ ، ص.ب ٨٨ ... عمان - الأردن

JADIS / Jordan Antiquities Database and Information System

20-05-20

01

Full JADIS Report

1. Site no.: 2619-006
2. English Name: NN/SITE 2619.006

3. UTM zone: 37 4. UTM east: 239100 5. UTM north: 3585900

6. UTM calculated 7. UTM sited

8. PG calculated 9. PG sited

10. Palestine grid east: 265,100 11. Palestine grid north: 198,700

12. K737: 3254.4.NE 13. Other map no.:

14. Air photo series: 15. Air photo no.:

16. Satellite photo no.:

17. Site size: 18. Max elevation:

19. Type of Site and 20. Period and Type of Use

UNSPECIFIED PERIOD STRUCTURE 66)TABUN

21. Topographic location: 0)UNKNOWN LOCATION

22. Site condition: 00)NO INFORMATION

23. Disturbances: 00)NO INFORMATION

Other Disturbances

24. Inventory rating:

Dam:

Quarry:

25. Type & level of threat of destruction by:

Cultivation:

Other:

Construction:

Erosion

Road work:

Development:

28. Visit da

te:

26. Archaeology of Jordan References:

30. Encoding

date: 22-03-1994

27. Visited by:

29. Encoded by:

31. Notes: No bibliography; No information.

32. Other reference:

JADIS / Jordan Antiquities Database and Information System

20-05-20

01

Full JADIS Report

1. Site no.: 2620-010
2. English Name: NN/SITE 2620.010

3. UTM zone: 37 4. UTM east: 237900 5. UTM north: 3589400

6. UTM calculated 7. UTM sited

8. PG calculated 9. PG sited

10. Palestine grid east: 264,300 11. Palestine grid north: 202,100

12. K737: 3254.4.NE 13. Other map no.:

14. Air photo series: 15. Air photo no.:

16. Satellite photo no.:

17. Site size: 18. Max elevation:

19. Type of Site and 20. Period and Type of Use

UNSPECIFIED PERIOD STRUCTURE 25) OTHER/UNSPECIFIED STRUCTURE OR WALL

21. Topographic location: 0) UNKNOWN LOCATION

22. Site condition: 00) NO INFORMATION

23. Disturbances: 00) NO INFORMATION

Other Disturbances

24. Inventory rating: Dam: Quarry:

25. Type & level of threat of destruction by: Cultivation: Other:

Construction: Erosion

Road work:

Development:

28. Visit da

te:

26. Archaeology of Jordan References:

30. Encoding

date: 03-04-1994

27. Visited by:

29. Encoded by:

31. Notes: No bibliography; No information.

32. Other reference:

Page 2 o

f 2

CH2MHILL

CH2M HILL Jordan
c/o Jordanian Consulting Engineer Co.
Abdel Hameed Sharaf St.
Air France Building
P.O. Box 926963
Amman, 11190 Jordan
Tel ++962 6 5 606150
Fax ++962 6 5 682150
e-mail: CH2M@go.com.jo

Mr. Akel Biltaji,
Minister of Tourism and Antiquities
Ministry of Tourism and Antiquities
Amman, Jordan

April 23, 2001

Dear Mr. Biltaji,

The Ministry of Water and Irrigation (MWI) of Jordan is cooperating with the United States Agency for International Development (USAID) to study and upgrade the existing wastewater treatment plant for the town of Mafraq in northern Jordan. In addition to upgrading the plant, the project will implement an effluent reuse scheme that would serve as a demonstration project for other small to medium sized towns in Jordan.

In accordance to USAID regulations, an Environmental Assessment (EA) report will be prepared for the proposed project. The EA requires identifying significant environmental issues associated with the project, including effects on archeological and historical sites. Since the proposed plant will be constructed within the boundaries of the existing plant, the archeological effects relating to the proposed reuse sites are of greater concern.

We would appreciate your providing us with information about the likelihood of the existence of any archeological sites within the area, as well as any plans for tourism development in the region which may be affected by the construction of the new plant and the reuse sites.

Please find attached a copy of the Pre-Scoping Brief, which summarizes the proposed project and the major environmental issues. A map of the area and the existing WWTP site is included in the Brief, and the approximate areas of the plant and proposed reuse sites are highlighted.

We look forward to hearing from you at your earliest convenience.

Yours sincerely,

CH2M HILL
Charlotte C. Nielsen
Environmental Task Leader

يحول الأصل لعطوفة مدير عام دائرة الآثار
وصورة/م.م. لمدير المواقع السياحية
٢٠٠١/٥/٥

بسم الله الرحمن الرحيم

THE HASHEMITE KINGDOM OF JORDAN

MINISTRY OF TOURISM & ANTIQUITIES

المملكة الاردنية الهاشمية

وزارة السياحة والآثار

الرقم : .....

التاريخ الهجري : .....

التاريخ الميلادي : .....

Ref 62/18/1/4433

Date 20/5/2001

JORDAN THINK BIG

الأردن على قدر أهل العزم

CH2M HILL
Mrs. Charlohe C. Nielsen
Environmental Task leader
P.O .Box 926963
11190 Amman
Jordan .

Dear Mrs. Nielsen

Reference is made to your letters dated 23/4/2001 and 16/5/2001, regarding the Mafraq Wastewater Treatment plant and Reuse Application project .

Please note that there is no development plans for tourism in the Project area , in the near future .

Best regards

Dr. Alia Hatough - Bouran
Director General
Ministry of Tourism and Antiquities

Tel: (962-6) 4642311/4 Fax: (962-6) 4648465

هاتف ٤٦٤٢٣١١/٤ (٩٦٢-٦) فاكس ٤٦٤٨٤٦٥ (٩٦٢-٦)

CH2M HILL Jordan
c/o Jordanian Consulting Engineer Co.
Abdel Hameed Sharaf St.
Air France Building
P.O. Box 926963
Amman, 11190 Jordan
Tel ++962 6 5 606150
Fax ++962 6 5 682150
e-mail: CH2M@go.com.jo

CH2MHILL

Mr. Salah Hyari
Ministry of Health
Amman, Jordan

April 23, 2001

Re.: Mafraq Wastewater Treatment Plant and Reuse Application Project

Dear Mr. Hyari,

As was discussed on the phone, I would appreciate your supplying me with any available information regarding the following issues:

- Recommendations for limiting exposure to pathogens in treated wastewater and sludge
- Recommendations for occupational safety and health measures to implement during construction and operation of the WWTP, and use of the plant's effluent on the reuse fields
- Any health statistics for the Mafraq area (such as medical services available and particularly any reported water-borne diseases)

Please feel free to call me at 079-877-888 with any questions. I look forward to receiving your response at your earliest convenience as we will need to incorporate your valuable input into the project's Environmental Assessment. Thank you for your time.

Yours sincerely,

Charlotte C. Nielsen

CH2M HILL
Charlotte C. Nielsen
Environmental Task Leader

CH2M HILL Jordan
c/o Jordanian Consulting Engineer Co.
Abdel-Hameed Sharaf St.
Air France Building
P.O. Box 926963
Amman, 11190 Jordan
Tel ++962 6 5 606150
Fax ++962 6 5 682150
e-mail: CH2M@go.com.jo

Engineer Mohammed Shahbaz
Al-BADIA Project Director
Higher Council for Science and Technology

May 16, 2001

Dear Mr. Shahbaz,

We have been trying repeatedly to obtain information from your department for the Mafraq Wastewater and Reuse Application project. We would greatly appreciate your speedy response to our request for information about ecology, agriculture and land use in the Badia, particularly in the Mafraq area.

We have a limited time in which to include this valuable information about the Badia in our report. If we do not receive the information by May 23rd, we will assume that it is not available.

Yours sincerely,

Charlotte C. Nielsen

CH2M HILL
Charlotte C. Nielsen
Environmental Task Leader

23/5/01

Dear Charlotte,

In reference to the Mafraq treatment plant scoping document I received from your good self, please note the following remarks.

1. Personel training programs, regarding the operations, theories and initiatives.

2. Stringent plant maintenance program

3. spare parts availability on location, including a practical inventory system.

4. Treated waste water applications, at this stage I prefere foradge production.

5. A serious base line data gathering should be organized, including vector carriers such as insects or mamals, and human health.

6. There must be held a public hearing, with full participation of locals and concerned NGOs.

Best wishes.

M. Shahbaz

jce

From: ARNAOUT, Dr Said HSG/RA <arnaouts@who.sci.eg>
To: <Jce@go.com.jo>
Sent: الثلاثاء، مايو ١٥، ٢٠٠١ ١:٤٨ PM
Subject: Inquiry on occupational safety and health standards

From: RA/HSG
To: Ms Lama Bashour
Date: 15 May 2001
Subject: Information request on WHO standards for Occupational Safety and Health.

Dear Ms Bashour:
We acknowledge with thanks receipt of your e-mail of 14 may 2001 regarding the above-mentioned subject.

Kindly, be informed that WHO, through joint committees with ILO and many other international agencies and organizations contributes to developing many occupational health and Safety issues including occupational safety and health standards.

However, the most widely-used standards are of OSHA and ACGIH (USA). Their Web sites are accessible as foliows.

In this connection we also can send you "A Guidelines on the Standards and Limits of Occupational xposure", prepared by The Arab Labour Organization/Arab Institute for Occupational Safety and Health if you provide us with appropriate address.

Your intrest in occupational safety and health is highly appreciated.

Looking forward to hearing from you
With kindest regards

http://www.osha-slc.gov/OshStd_toc/OSHA_Std_toc.html
http://www.lni.wa.gov/wisha/regs/wacindex.htm

http://whqlibdoc.who.int/hq/1999/WHO_SDE_OEH_99.14.pdf

Dr. Said Arnaout,
Regional Advisor,
Health of Special Groups (HSG)
WHO/EMRO
Tel: 00(202)6702535
Ext: 65380
Fax: 00(202) 6702492
E-mail: arnaouts@emro.who.int
Mail Address:
World Health Organization
Easteren Mediterranean Regional Office
Abdul Razzak Alsanhouri Street
P.O.Box 7608, Nasr City
Cairo 11371
EGYPT